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ABSTRACT

Effective curriculum is based on a mastery learning model. According to Carroll's mastery learning model, learning rate is partially a function of student "perseverance" or time on task, which is in turn determined by a learner's entering repertoire and the quality of instruction. Although the mastery-learning model looks simple, its execution is enormously difficult. Difficulties include designing scope and sequence of curriculum, varying instructional time to fit different learning rates, varying content and level, and sustaining administrator commitment. Since implementing mastery-based curriculum is so difficult, it is often distorted into more traditional curriculum. This means that mastery-based, assessment-driven curriculum is often distorted into time-based, assignment-driven curriculum. At the curricular level, this distortion is evidenced by such things as low motivation, tests that do not truly measure mastery, and traditional grading. At the instructional level, the seven criteria for mastery learning are often distorted. These criteria include precise definition of instructional objectives, direct instruction, immediate feedback, appropriate level of instruction, modular learning, stimulus control, and critical response. Although research shows mastery learning to have superior results, it will not be successful in schools unless its distortions are eliminated. (JM)

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EFFECTIVE CURRICULUM AND INSTRUCTION: THE INSTRUCTIONAL PSYCHOLOGIST'S VIEW

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The Instructional Psychologist

Instructional psychologists study causes of learning in formal instructional settings. How undramatic! Such a humdrum pursuit rarely catches the imagination of aspiring psychologists and almost never grabs the six o'clock news.

But the six o'clock news grabbed us, one day, after a mastery learning program generated dramatic gains in reading test scores. About 53% of the severely disadvantaged eighth graders who had entered their junior high school two to four years retarded in reading had made one to 5 1/2 years gain in only six months of instruction. That's news. And ABC-TV wanted to explain how it happened (in three five-minute installments, of course). How does one make the humdrum substance of applied instructional psychology into the extraordinary?

After all, when we leave our research settings and intrude on the grade school, instructional psychologists are like guns for hire: Someone WITH POWER decides that

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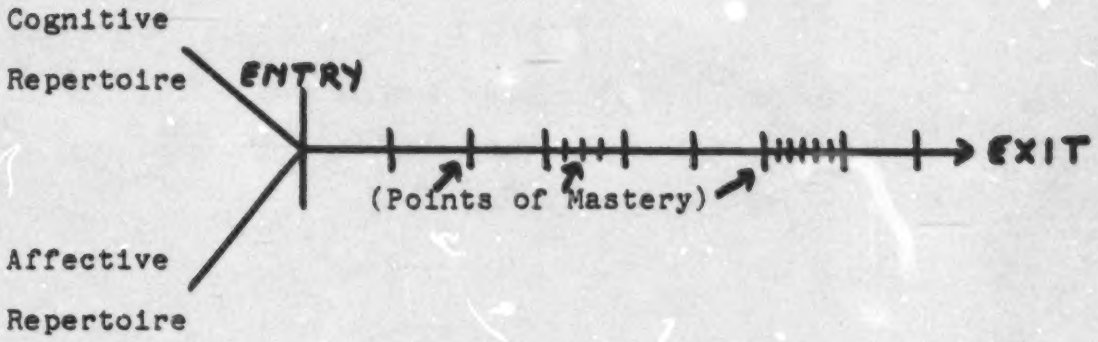
something will be taught to someone. That power hires us to practice the state of the art of causing learning to occur. That state of the art, while far from optimal, is nevertheless light years ahead of what occurs in the typical classroom, which is why we were less surprised at these dramatic gains than ABC-TV news appeared to be. But an explanation of the state of the art is no less humdrum. The explanation cannot compete with the antics of world leaders, or with Monday night football. It cannot even compete with the weather report in full color.

What is that state of the art?

Learning for Mastery

Almost 20 years ago, John Carroll (1963) published his model of school learning. Bloom (1973) calls Carroll's a time and mastery learning model. Mager (1979) calls the same concept "criterion referenced instruction." Most of us refer to it simply as effective curriculum. Our version of Carroll's model is simple:

Figure A: A Mastery Learning Curriculum Model



1. Define a curriculum, or a course of study, or a training program as a continuum with points of mastery along the way. These points of mastery are more popularly known as "competencies," or "behaviorally defined objectives," or "criterion performances," or "target concepts." The number of these points of mastery and of their varying levels depends upon how sophisticated the curriculum or program design is. The level of sophistication is usually a function of how important the curriculum is. So, for example, in industry a course for middle management in theories of economics will be highly structured with many levels of competencies; every activity and every lesson will be competency based and tests will be criterion referenced. In industry, we generally plan 60 hours of preparation for each hour of instruction. But in public schools, curriculum apparently is not so important; teachers and administrators will not usually do the

behavioral analyses and painstaking curriculum development comparable to what industry does. If one judges importance by amount of time, effort and money, then school learning is not as important as school people claim. All other things being equal, the finer the points--i.e., the more truly competency based every instructional activity is--the more efficient the curriculum and the more dramatic the results. The school does not appear to spend much of its resources creating such finely honed competency-based curricula.

2. Each learner brings to a curriculum a unique cognitive and affective repertoire. Educators love to speculate about the nature of these repertoires. Unfortunately, we know very little about them, which is one reason we have invented the terms "cognitive" and "affective." If we knew what we were talking about, we would use more specific terms.

3. These entry repertoires determine the speed at which learners could demonstrate mastery as they move through a curriculum. Differences in entering repertoires explain differences in learning rate assuming, of course, the instruction itself does not impede progress.

4. In fact, 50 years of research demonstrate that rate of learning and not ability level is the most dependable and consistent discriminator among learners. There are faster and slower learners. In 1963 Carroll

redefined "aptitude" as simply a measure of learning rate, not a measure of "ability."

5. Time, then, is the critical discriminator. Therefore, if we vary the instructional time for each learner to insure demonstrated mastery before trying to teach the learner the next "objective" (point of mastery), then every learner will master almost anything reasonable that we build into a curriculum.

6. If we make sure mastery is demonstrated before moving instruction to the next competency, few will fail, and the learning rate of the "slow" learners will begin to approach that of the "fast" learners as the slow learners approach the end of the continuum.

7. If we analyze the learner's activity, we will note that learning rate is partially a function of perseverance. That is, in five minutes of instruction, fast learners stick to the learning task a larger percentage of clock time than do slower learners. Carroll called it "perseverance." Block (1975) and the University of Chicago group call it "time on task." We call and measure it as P Ratio, the percentage of clock time the learner participates in the prescribed (intended) learning activity. School people have traditionally called it "motivation to learn," a dangerous term for two reasons.

First, it implies the opposite, "lack of motivation," which almost never occurs in school. Many children are

strongly motivated to tune out, to climb walls, to avoid reading, to misbehave. These children are often mislabeled as "unmotivated," when in fact their "unacceptable" behaviors require high motivation. The key, of course, is not motivation, but direction of motivation to participate or not in the intended task--to be on the learning task or on another wave length. Either option requires considerable motivation.

Second, to assume the existence of motivation in every learner (i.e., to assume there is never absence of motivation) is to lay the groundwork for designing strategies to control the DIRECTION of motivation. In plain English, it's a helluva lot easier to manipulate the direction of human energy than to generate it in someone else.

8. A learner's entering repertoire plus the quality of instruction (QOI) determine P Ratio, which in turn, determines rate of demonstrated mastery.

Some Hidden Agendas

The mastery learning model is simple enough. But it deceives. Its execution is enormously time consuming, technical and difficult for teachers and administrators, who in the normal course of teacher education and experience, are not trained in competency-based teaching. Consider these hidden agendas.

CURRICULUM DESIGN DILEMMAS: Consider just the first concept in the mastery learning model: 'Define a competency-based curriculum with a sequence of defined points of mastery.' Easier said than done! Nothing in curriculum is more difficult than trying to decide what to teach and in what sequence to teach it.

On the one hand, the technical challenge is overwhelming. For example, what specific, behaviorally defined operations under what conditions cause children to learn "to read," or "to think critically," or "to understand how other people feel"? What do we want to see in students that cause us to say, "They have demonstrated mastery"? What is the appropriate sequence of such operations? How do we define the "undefinables" that we love to claim as goals of effective education, such darlings as "improved self concept," "self awareness," "creativity," "art appreciation," "the tragic sense in literature and life," etc.

If we believe such esoteric goals are undefinable, do we settle for lists of mundane, often irrelevant skills, double consonant words, regurgitation of historical facts, spelling lists, responses to 50 multiple-choice items? If the mastery learning curriculum is objective based, geared to intentional learning, how does the program handle incidental learning? If we are not sure of the validity of our instructional objectives and our sequences, and we

nevertheless demand demonstrated mastery before allowing a student to proceed, how can we justify holding students until they master the prescribed objective? How do we accomodate the probability that different learners may best pursue different paths to common instructional outcomes? How do we avoid mistaking correlates of critical instructional outcomes with the key behaviors themselves, causing our students to demonstrate mastery of irrelevant behaviors, only to discover too late that our points of mastery do not lead to critical payoffs?

On the other hand, assuming we can define such points of demonstrated mastery; assuming we have the ability to perform task analysis that allows us to define the "undefinables," their critical intermediate steps, and the appropriate sequences; assuming we can develop and gather the human and material resources and strategies to cause students to demonstrate mastery--to what cognitive, affective and skill domains do we apply our analytic techniques that generate the instructional objectives?

The posing of this question is more frightening and fundamental than the technical challenges described above, for when we assume the task of designing a mastery learning curriculum, we cannot escape the most sobering of all educational questions:

What is worth teaching?

Restated, this question becomes:

Is what I intend to make of other people's children the right thing to do?

However overwhelming the technical challenge of designing objective-based instruction appears to be, the ethical implications of making such critical value decisions is horrendously humbling.

The ethical problem is not peculiar to mastery learning. All curriculum designs could demand of designers a moment of truth, at which time educators must face or not face the fact that they are involved in coercing others into certain value systems. We have only two options in relation to this issue. We can choose either to try to know what values we are forcing upon other people's children, or we can try to avoid knowing. Under both conditions, the acts of coercion are still present; in one condition the acts are generated by intelligence; in the other condition the acts are generated by ignorance. There are some who mislabel such ignorance as innocence, and on blind faith believe that behind their innocence lies purity of intent. Incorrectly describing themselves as "humanists," they refuse to define operationally the instructional outcomes they seek, using the technical challenge argument, but avoiding the more profound ethical issue of values.

Mastery learning is frightening because it denies the comfort of avoiding a confrontation with our own values; it

denies us the opportunity to act as if we are not doing what we are in fact doing. It requires us to know what we do to our students. It denies us the certainty that our good intentions are sufficient assurance of equally good actions. The audacity of certainty is strong evidence that ignorance may be at play, for when we are sure that what we teach is worth teaching, we can suspect that we did not define our instructional objectives clearly and precisely. Having invested enormous effort and ego in developing the questionable sequence of questionable instructional objectives, it is not comforting to accept the probability that many of these objectives are irrelevant, some are counterproductive, and a few are certainly harmful to our constituents.

But what other choice do we have except to teach from whim rather than from critical intelligence, in which case we simply ignore the irrelevant, the counterproductive and the harmful and act as if they do not exist? That is irresponsible.

DIFFERENTIATING RATES: Consider items two through five in the mastery learning model above, the relationship between the unique cognitive and affective repertoire each learner brings with her/him and the rate of learning which is primarily a function of P Ratio (perseverance, time on task). Carroll proposed that every learner would show demonstrated mastery if we varied the instructional time

according to individual needs. At the same time, we could increase P Ratio by improving the "quality of instruction" (QOI).

The design of curriculum is unquestionably a more difficult problem than is the differentiated learning rates in a classroom of 30 students. That design requires a data based, precision designed, sophisticated curriculum rarely found in most public schools, although commonplace in industry and the military. But another hidden agenda, a familiar problem in public schools, lurks in Carroll's proposal to vary instructional time--the problem of differentiating instruction. How does one teacher vary the amount of instructional time to match 30 individuals' needs? Mastery learning did not invent this problem. Differentiating instructional time has been around ever since Horace Mann invented the modern American school.

DIFFERENTIATING CONTENT AND LEVEL: And if varying rates were not enough of a challenge, how do we vary content and level of instruction? If some students reach a a point of mastery along the curriculum sequence before others, how does one teacher with 30 students accomodate such differences? What holding patterns do we rationalize into "enrichment" activities to maintain instructional homogeneity? Or do we allow, as Carroll's model implies, continuous progress, opening the curriculum to total individualization that will result in greater

heterogeneity?

Again, teachers have struggled over this issue long before most of us arrived on the scene with our new panacea, mastery learning. And these problems are the hidden agendas that are not easily resolved when schools commit themselves to Carroll's model.

COMMITMENT OF LEADERS: Perhaps the most difficult agenda to resolve when considering mastery learning is the absence of strong leadership among administrators, especially building principals. Hyman & Cohen's (1979) report on 3000 mastery learning schools cites the presence of such leadership as the key to success when implementing mastery learning programs. Apparently, as difficult as the design and individualization agendas appear to be, Hyman & Cohen are less concerned with them, and more concerned with the absence or presence of principals who can cause their schools to modify curriculum.

Carroll's mastery learning model is parsimonious and logical. It has generated enormously successful educational programs, empirically validated more than any other curriculum model in the history of education (Block, 1976). But its symmetry and simplicity can mislead some zealots to act as if mastery learning is easy to implement. It is not! Mastery learning is not an easy curriculum to design when it is done correctly, which is why perhaps, so many published programs and school curricula are corrupting the

model. They are using the terminology, but they are simply pouring old wine into new bottles. Unable to resolve the problems in these hidden agendas, they have distorted Carroll's model to fit the convenience of the status quo. This will almost certainly destroy the impact of Carroll's work and reinforce the American public's current image of a failing public school system. Let us summarize these corruptions.

Contrasting Mastery Learning and Traditional Curricula at the Program Level

Spady (1981) characterizes mastery learning curricula as competency-based and assessment-driven. The learner participates in the specific learning activities that shape that individual's needed competencies. The learner moves through a program on the basis of assessed need.

Spady contrasts the competency-based, assessment-driven features of mastery learning with the time-based, assignment-driven features of the traditional graded curriculum. Grades are age or time-based categories. In third grade, for example, one gets third grade instruction available in three styles, one for canaries, one for pidgeons and one for vultures. (Vultures usually have darker skins and are affectionately referred to as "those kinds of children.") A set of expectancies in

the form of basal reader levels, or assignments are associated with each age-time-grade slot. Progress through this type of curriculum is determined not by demonstrated competency, but by completion of assignments (books, levels, etc.) as well as the "putting in" of one's allotted time in grade.

Time-based, assignment-driven oriented educators think in levels. Mastery-based, assessment-driven oriented educators think in competencies. The former promote children and the latter assess them.

The most obvious corruption of mastery learning is the ubiquitous practice of squeezing a continuous progress, competency-based, assessment-driven model into the graded mode, time-based, assignment-driven. We see second grade level mastery learning materials, a rather absurd contradiction of terms. We see teachers expending significant amounts of creative energy inventing ingenious holding patterns for fast learners as they try to "catch up" slow learners with correctives. They call these holding patterns "enrichment activities." Some of the old timers call it "valuable busy work." If the busy work is valuable, one wonders why advocates of more "enrichment" do not place those enrichments in the core curriculum. Just how valuable are they?

We see fuzzy goals posing as behaviorally defined instructional objectives, or general tests of "levels of

achievement" masquerading under the mislabel of "criterion referenced tests of mastery." In other words, we see the same old wine in the same old bottles with a new label that misrepresents the product. Unfortunately, America's public school curricula are not within the jurisdiction of the federal Food and Drug Administration.

Figure 2 summarizes the distortions required to make mastery learning fit time-based, assignment-driven school curricula.

Figure 2: Mastery-Based vs. Time-Based Curricula

Mastery-Based Assessment-Driven	Distortions into Time Based, Assignment-Driven
1. Maximum P ratio/high motivation	Minimum P ratio/low motivation
2. Criterion referenced tests (mastered or not mastered)	Norm referenced tests (more or less mastered)
3. Demonstrated mastery "Everyole's a winner!"	A,B,C,D,E,F "She's okay; he's not."
4. Differences in rates	Differences in levels
5. More heterogeneity	More homogeneity
6. Teacher & learner responsibility	Only students can fail
7. Continuous progress and monitoring	Five to eight marking periods
8. Continuous monitoring & changing objectives	I before E except after C until next text adoption
9. "Here's what they've learned."	"Here's what I taught."

Let us review Figure 2.

1. At least two propositions in applied instructional psychology are certain:

   a. P Ratio, the percentage of clock time the learner spends on the prescribed learning activity ("time on task," "perseverance"), is a critical component of instructional effectiveness.

   b. Curriculum alignment accounts for much of the gains we see in mastery learning, and

that alignment contributes to high P Ratio. Curriculum alignment is the degree to which the intended instructional outcome, the resources and strategies used to cause that outcome, and the test used to assess that outcome are all behaviorally congruent. In plain English, alignment (congruence) means that we test what we teach, and we teach precisely what we want the learner to learn. Such precision causes demonstrated mastery. Demonstrated mastery, in turn, causes the learner to stick to the task, to persevere, to participate in the prescribed learning activity. Apparently, learners like to succeed, and except in rare cases of pathology, most people tend to move toward activities at which they succeed.

Since the psychodynamics underlying most variations of mastery learning derive from Carroll's perseverance construct, it is not surprising to see high P Ratios in the competency-based, assessment-driven curriculum. In contrast, what is routine in the mastery learning classroom is occasionally observed in time-based, assignment-driven programs. But when observed, it is "outstanding," because it is not routine under the traditional program design.

Thus, when we force mastery-based into time-based curricula, we can expect to see P Ratio decline.

2. One of the surest symptoms of corruption resulting from forcing mastery-based, assessment-driven into time-based, assignment-driven curricula is the presence of

tests generating scores of more-or-less mastery. In "pure" mastery learning, something we rarely see in grade schools, a learner is certified as having mastered or not mastered an intended instructional outcome. There is no more-or-less mastery.

The very nature of a behaviorally defined objective obviates this proposition. For example, consider this objective, an operant we expect a learner to demonstrate:

> Given 15 "free minutes" during the school day, and the option of going to the playground, using water colors, playing a video game, resting or reading a book of his/her choice, S chooses the latter 80% of the time.

Either the student does or does not do this 80% of the time. If a student does this 72% of the time, and the teacher begins to wonder if this is not a significant ratio, then the criterion level of the instructional objective deserves to be reconsidered. In criterion referenced assessment, the criterion of acceptance is set, and the student either demonstrates or does not demonstrate mastery. There is no more-or-less; there is only mastery and non mastery.

3. Non mastery indicates NOT YET MASTERED. Under mastery learning, the amount of time needed for instruction is varied according to each student's learning rate. If Carroll's mastery learning model has any meaning at all,

certainly this is the key message. In other words, every child is a winner in the mastery learning classroom. Some win faster than others. Some win, therefore, more than others, but no one loses. There are no failures; there are only those who have not yet demonstrated mastery.

That is why the traditional grading system is the most obvious corruption of mastery learning. Some students with A and some with F is a sure sign that we are in the presence of a time-based, assignment-driven and not a mastery learning program.

4. In a mastery learning curriculum, the home reporting system indicates what is mastered, what is not mastered and, perhaps, a comparison with peers on some norm, not on LEVEL of learning but on RATE of learning. Next to the traditional grading system, the stress on level is a sure sign that a time-based, assignment-driven program is present in spite of the mastery learning label.

5. Unless the program has invented "holding patterns," and most seem to have done so, mastery learning should lead to greater heterogeneity, not homogeneity. Some advocates of mastery learning compromise the model to placate educators' fears that Carroll's invention will obviate what some educators try so hard to hide, individual differences of rate. They suggest using faster learners as tutors of slower learners to help reduce differences in the classroom. But such a compromise is, of course, a

corruption when the mastery-based, assessment-driven curriculum is forced into the traditional time-based, assignment-driven program.

Cohen (1981) has reported increased means for most children taught in mastery learning programs. But he points out that beyond minimum competencies, the differences among learners represented by the standard deviations and the ranges, increase after being subjected to that competency-based, assessment-driven procedure.

6. If instructional time is varied for each learner, if every learner can, in time, learn whatever is defined as a point of demonstrated mastery, then non demonstration of mastery is a reflection on two parties, the learner and the teacher. On the one hand, the learner has not yet mastered the competency. On the other hand, the teacher has not yet supplied enough instruction. "Enough" refers to quality as well as quantity.

Another symptom of corruption is student failures. Since non mastery as well as mastery are the result of two parties, one would expect to see either no failures (just "not yet mastered"), or two parties failing, the teacher and the learner. Instead, what we almost always see in schools are failures by one party only, indicating that a mastery learning system may not be in operation.

7. Since amount of time needed to reach a point of demonstrated mastery varies among students, mastery is

demonstrated again and again in a class period as part of the regular instructional routine. In a mastery learning program students progress as they demonstrate mastery. That is the very essence of the term, "mastery-based, assessment-driven." For a mastery learning program, one can report progress at any point in time. One is not boxed into a five to eight-period marking cycle. In a mastery learning program one would not expect to hear the traditional threat, "You'll flunk this marking period."

8. By analyzing progress across many students, the mastery learning program can continuously monitor the validity of its objectives and their sequences, changing them accordingly without waiting for the next "adoption." When school curricula are controlled by adopted texts, one can suspect that teachers are teaching programs, not students; i.e., what determines the instructional stimuli that a student receives in the adoption-oriented curriculum is what assignment comes next in the fourth grade "program." This is radically different from the competency-based, assessment-driven curriculum in which the student's next lesson is determined by assessment of competency.

9. The mastery-based program is learning oriented, not teaching oriented. What should ultimately determine a curriculum's viability is not what is taught, but what is learned. Decisions in a mastery-based program are

determined by what students have learned or not learned, not by what the teacher covered, or what the curriculum covered. One can suspect that a mastery learning program has been distorted when the discussion at the faculty meetings tend to center on what was covered rather than on what was learned.

Contrasting Mastery Learning and Traditional Curricula at the Instructional Level

Mastery-based, assessment-driven and time-based, assignment-driven programs not only differ at the curriculum level, but at the more critical instructional level as well, more critical because the instructional level is where the curriculum directly confronts the learner. Cohen (1981, 1977a) and Hyman & Cohen (1979) have described seven criteria they use to choose or design instructional materials, resources and strategies. They structure instructional processes by these criteria. Figure 3 summarizes these criteria of mastery-based instruction and the distortions required to make mastery-based instruction fit time-based, assignment-driven structures.

Figure 3: Mastery-Based vs. Time-Based Instruction

Mastery-Based Instruction	Distortions into Time-Based
1. Define the instructional objective precisely	Keep the objective fuzzy
2. Direct instruction (alignment)	Define A, teach B, test C
3. Immediate feedback	Delay feedback: "Wait your turn!"
4. Appropriate level	Make them hurt; failure builds character
5. Small bites--modular learning	Mid terms and finals
6. Stimulus control	Correct is correct, who cares why?
7. Critical response	Trick the students

Let us review Figure 3.

1. "What we teach can't be defined," is a common form of contemporary educational sloth. One cannot have competency-based instruction without competencies, defined behavioral objectives that describe for both the learner as well as the teacher the instructional outcome sought. Carroll (1963) pointed out that one of the key ingredients of effective instruction is the clear picture that the learner has of the expected instructional outcome. He felt that instructional effectiveness is proportional to how clearly the learner sees that outcome.

What we teach often is difficult to define precisely. But difficulty does not excuse us from the obligation to define. If alignment is one of the two key components of effective instruction, then the clarity of the outcome is

essential to insure that the processes and assessments are congruent. Fuzzy objectives are a sure sign that mastery learning has been distorted to fit the statis quo.

2. "Direct instruction" is one of those current "in-terms." Some people misuse it to describe a teacher-delivered lesson, operationally defined as the teacher talking "directly" to his or her students. Actually, the term means alignment, congruence. A mastery learning instructional sequence is competency-based; the student and the teacher know exactly what outcome they seek; the materials, activities, and teaching resources are behaviorally congruent with the post instructional assessment. The instructor defines A, causes the student to perform A and measures A.

3. The more immediate the feedback, the more efficient the learning curve. When every child is "next," we get efficient instruction. The more delayed the feedback, the less likely an effective contingency system is established, the less "learning" appears to occur. When children are waiting their turn in an instructional setting, the strategy needs to be redesigned; that is what we call low P Ratio or low intensity instruction.

4. P Ratio is maximized when the feedback is positive enough to keep learners on task, but not so positive as to bore them. Inversely, P Ratio is maximized when the feedback is negative enough to challenge learners to attend

to the task, but not so negative as to frustrate them. Generally speaking, very fast learners tend to bore more easily when feedback is positive too often. Slow learners with long histories of failure, on the other hand, need continuous positive feedback before one dares to allow negative feedback. In other words, one major role of the teacher in an effective, competency-based instructional strategy is not to deliver the learning stimuli and feedback, but to automate those factors in order to free himself (herself) to continuously adjust the delicate balance of positive to negative feedback to cause optimum P Ratio for each individual learner. That delicate balance will vary from learner to learner, from task to task, from day to day.

How difficult it is to convince school people of the importance of this task! Balancing the feedback to insure the appropriate level of instruction is a full time task for any teacher. That is why it is so critical to separate the delivery of lessons from the teacher to other sources in the environment; most teachers are "too busy teaching" to perform the substantive tasks that cause increased P Ratio. Worse yet, some teachers still believe that failure builds character.

5. The most potent positive feedback to any learner is the knowledge that a task or outcome is completed. The "need to seek closure" is simply another term for

describing "goal-oriented behavior." Instead of mid terms and finals, two closure points per semester, better instructional practice dictates daily closures, requiring the teacher to structure a program into modules of small learning bites. When learners see short-term points of mastery, they tend to stay on task. P Ratio increases.

6. The stimulus control principle has long captured the attention of experimental psychologists. Whatever else one chooses to include in a definition of learning, it does involve at least an appropriate response in the presence of a stimulus condition. The major challenge to the instructor or program developer is to know for certain what precise part of the stimulus condition trips the appropriate response. Does the beginning reader respond correctly to the picture or the letters representing the word? Does the student respond correctly to the social condition desired or to the tone in the teacher's voice? In other words, it is not enough to know that the learner responds correctly at the points of mastery; we must be certain that the correct reponse is to the appropriate stimulus.

7. The name of the game is not to trick the student. How often do teachers present lessons that stress one thing and then present tests that require responses that were not the focus of instruction? Good instruction tells students what the test will ask of them, requires them to respond

precisely as they will on the test, reinforces those reponses when they are appropriate, and then tests as the instruction promised it would. In other words, good instruction not only defines the precise stimulus intended to elicit the appropriate response, but defines as well the critical response sought in order to reinforce that precise response in the presence of the critical stimulus.

These seven criteria imply a teacher role somewhat different from the traditional view of the pedagogue. The task of defining the precise instructional objectives, so precise that the student and the teacher know exactly what the critical responses and contingent stimuli are, is an ongoing teaching task. Also ongoing is the task of aligning curriculum, constantly redesigning lessons and materials so that intended outcomes, processes and assessments are congruent. Designing better ways of delivering feedback and continuously adjusting each student's activities to balance the feedback to obtain the appropriate level, and modularizing the programs without chopping them into discrete, disconnected tasks is an enormous job. How enormous? It requires that the basic, substantive lesson is delivered by some other source--materials, other students, self-direction--to free the teacher to perform these tasks. Effective instruction depends upon how well the teacher performs such tasks.

In other words, a learning oriented classroom

contrasted with the traditional teaching oriented classroom requires a redefinition of the teaching role. In the mastery-based, assessment-driven classroom, the teacher is a highly skilled professional who is an expert in shaping those students' behaviors that cause them to learn. In contrast, in the time-based, assignment-driven classroom, the teacher maintains the traditional role of lecturer with up-front performances, for teaching not learning is the name of the game.

Effects of Mastery Learning, and Unanswered Questions

Mastery learning, says James Block, is the most researched approach to curriculum in the history of education (Block & Burns, 1976). Elsewhere I have reported evaluation results in reading achievement and math for mastery learning programs (Cohen, 1981a, 1981b, 1977a). As far as we can tell, there is little need for more research on the differential effects on learning of mastery-based, assessment-driven compared to time-based assignment-driven curricula. At this stage of the history of curriculum, we assume that the former is demonstrated superior to the latter. Were there not an iota of data, common sense would dictate that clearly defined outcomes and demonstrated mastery will generate more effective learning than fuzzy goals and no required demonstration of mastery.

But many peripheral issues remain to be investigated. Many of these are beyond the interest as well as expertise of instructional psychologists. For example, what are the psychodynamics of individualized mastery learning systems such as PSI (Keller, 1968) and High Intensity Learning Systems (Cohen & Hyman, 1979; Kaplan & Cohen, 1979) compared to group-taught mastery learning programs such as the Reading House Series (Cohen & Hyman, 1977b)? Why do educators avoid competency based instructional programs? What are the most effective ways to implement curriculum change? How do we change the teacher's role? These are just 1 few fascinating problems that researchers should confront if we hope to reverse the current demise of the public schools as the viable institution it has been in the past.

However, these are not the type of questions instructional psychologists ask. We want to know what else besides alignment and P Ratio are the critical components of effective instruction within mastery learning programs. Apparently, learners' perceptions of themselves as learners--"expectancies"--as well as teachers' expectancies play a role in rate of mastery. But how much of that rate is so explained? How much change in these expectancies occur in programs geared to learning success, which is characteristic of mastery learning? How much do these changes effect mastery?

We want to continue to uncover factors that increase P Ratio. Is Blocm (1976) correct in predicting a closing of the discrepancy in learning rate between faster and slower learners as the latter demonstrate mastery along the curriculum continuum? How does this rate increase relate to P Ratio and ultimately to measures of self expectancy? Can we develop reliable measures of alignment and reveal the mathematical relationships among alignment, P Ratio and rate of mastery?

We already have evidence that forcing the individualized mastery learning model into the traditional group, time-based, assignment-driven school seems to reduce mastery learning's effectiveness (Rodriguez, 1979). But which of the seven criteria described above help explain this reduced effect? What compromises in these criteria occur, and how much learning rate is lost as a result?

These are just a few of the researchable areas that entice those of us in instructional psychology working in mastery learning.

Conclusions

We know that, in general, mastery learning causes more and faster mastery than time-based, assignment-driven programs. We know, too, that standardized achievement test data favor competency-based, assessment-driven curricula.

We know, too, that increased mastery and achievement is a function of (1) varying instructional time for each learner and (2) increasing P Ratio. We know that the seven criteria described above increase P Ratio and alignment, and that whatever else Carroll meant by "Quality of Instruction," alignment is a key ingredient and P Ratio is a dependable measure of it.

We know that individualized mastery learning is more consistent with Carroll's model and generates more dramatic results than does group-delivered mastery learning, the latter distorting many of mastery learning's potent characteristics. We know that individualized mastery learning increases heterogeneity.

Further, we know that much of what our colleagues are calling "mastery learning" in the schools are at least distortions and often serious corruptions of the mastery-based, assessment-driven model. Simply teaching to minimum competencies, one of the current fads, is a far cry from mastery learning. Only when competency-based instruction is coupled with assessment-driven procedures--implying continuous progress, varying instructional time and content, and the assumption that all learners will eventually demonstrate mastery--do we have learning for mastery in the true sense of what Carroll described in his original 1963 article.

When we have all those elements, plus the application

of those seven criteria of effective instruction, we will have high P Ratios and good alignment. The results are what instructional psychologists consider expected gains (Cohen, 1981a), and what ABC-TV perceived as dramatic gains.

Mastery learning, alignment and high P Ratio is the state of the art. The perceptive TV interviewer understood these elements. He then asked the question that drew me out of the safety of my own turf:

> "So, why isn't it done in every school? Why are so many schools failing so many of its children?"

That, good readers, is an issue in the hands of those who purport to "lead" the school community. As instructional psychologists, we can deliver the state of the art. But the administrator, the purported leader, is the only one who can make it happen.

REFERENCES

Block, J. & Burns, R. Mastery learning. In L.S. Schulman (Ed.), Review of Research in Education 4, Itasca, IL: F.E.Peacock Publishers, 1976.

Block, J. & Anderson, L. Mastery Learning in Classroom instruction. New York: Macmillan Publishing Co.,1975.

Bloom, B.S. Human characteristics and school learning. New

York: McGraw Hill, 1976.

Bloom, B.S. Time and learning. Thorndike Award Address, twenty-first annual convention of the American Psychological Association, Montreal, Quebec, 27 August 1973.

Carroll, J. A study of school learning, Teachers College Record, 1963, 64, 723-733.

Cohen, S.A. Components of effective instruction. Paper presented at the Northwest Regional Labs, Portland, Oregon, 10 November, 1981a.

Cohen, S.A. Dilemmas in the use of learner responsive delivery systems. Paper presented at the annual American Educational Research Association convention, Los Angeles, CA, Section 29.02, 16 April 1981b.

Cohen, S.A. & Hyman, J.S. High Intensity Learning Systems 2--Reading. New York: Random House, 1979.

Cohen, S.A. Instructional systems in reading: A report on the effects of a curriculum design based on a systems model. Reading World, 1977a, 16, 158-171.

Cohen, S.A. & Hyman, J.S. The Reading House Series. New York: Random House, 1977b.

Hyman, J.S. & Cohen, S.A. Learning for mastery: Ten conclusions after 15 years and 3000 schools. Educational Leadership, 1979, 37, 104-109.

Kaplan, J. & Cohen, S.A. High Intensity Learning Systems 2--Mathematics. New York: Random House, 1979.

Keller, F.S. Goodby teacher..... Journal of Applied Behavioral Science, 1968, 1, 79-89.

Mager, R. & Pipe, P. Criterion referenced instruction: Analysis, design and implementation. Los Altos Hills, CA: Mager Associates Inc., 1979.

Rodriguez, S. A comparison of socio-cultural teaching using a Ramirez-Castenada model with psychological strategies using PSI mastery learning. Doctoral dissertation, University of San Francisco, 1979.

Spady, W.G. Outcome-based instructional management: A sociological perspective. National Institute of Education, NIE-P-80-0194, January, 1981.